Earth Solutions NW LLC

Geotechnical Engineering
Construction Observation/Testing
Environmental Services

GEOTECHNICAL ENGINEERING STUDY
PROPOSED STEP BY STEP – ELC & ADMINISTRATIVE OFFICES FACILITY
XXX 33RD STREET SOUTHEAST
PUYALLUP, WASHINGTON

ES-8632

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PREPARED FOR

STEP BY STEP FAMILY SUPPORT CENTER

July 22, 2022

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07/22/2022

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Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will <u>not</u> likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will <u>not</u> be adequate to develop geotechnical design recommendations for the project.

Do <u>not</u> rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do <u>not</u> rely on an executive summary. Do <u>not</u> read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept* *responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL
BUSINESS
ASSOCIATION

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Earth Solutions NW LLC
Geotechnical Engineering, Construction
Observation/Testing and Environmental Services

July 22, 2022
ES-8632

Step by Step Family Support Center
P.O. Box 488
Milton, Washington 98354

Attention: Ms. Krista Linden

Dear Ms. Linden:

Earth Solutions NW, LLC (ESNW) is pleased to present this geotechnical engineering study to support the subject project. Based on the results of the study, the proposed development is feasible from a geotechnical standpoint. The study indicates the site is underlain primarily by nonglacial alluvium.

In our opinion, the proposed structures can be constructed on conventional continuous and spread footing foundations bearing upon competent native soil, recompacted native soil, or new structural fill. Competent native soil suitable for support of foundations will likely be encountered beginning at depths of about three to five feet below existing grades. Where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of the soil to the specifications of structural fill or overexcavation and replacement with suitable structural fill will likely be necessary.

Stormwater management is proposed using direct discharge to the Puyallup River by way of the existing ditch along 33rd Street Southeast. In the event additional capacity is needed, preliminary plans show a stormwater pond is proposed along the northwestern corner of the site. Construction of a stormwater detention pond is feasible from a geotechnical standpoint, provided adequate separation between the facility base and the seasonal high groundwater table can be incorporated into final designs. Based on the May 2022 field observations and our experience on projects in the local vicinity, we estimate the seasonal high groundwater table elevation occurs at about five to eight feet below existing grades. If a definitive groundwater elevation(s) is required, completion of a groundwater-monitoring program, through at least one wet season, is recommended. Additionally, the need to install a pond liner should be anticipated.

In our opinion, the native nonglacial alluvium deposits should be considered unsuitable for infiltration purposes from a geotechnical standpoint, given the appreciable fines contents and presence of relatively shallow groundwater.

The opportunity to be of service to you is appreciated. If you have any questions regarding the content of this geotechnical engineering study, please call.

Sincerely,

EARTH SOLUTIONS NW, LLC

Kyler T. Kelly, L.G.
Project Geologist

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INTRODUCTION

General

This geotechnical engineering study was prepared for the proposed development to be constructed northwest of the intersection between 33rd Street Southeast and 8th Avenue Southeast, in Puyallup, Washington. To complete this study, ESNW performed the following:

- Subsurface exploration to characterize soil and groundwater conditions.
- Laboratory testing of soil samples collected at the test pit locations.
- Engineering analyses.
- Preparation of this report.

The following documents and resources were reviewed as part of the report preparation:

- ALTA/NSPS Land Title Survey, prepared by Core Design, Inc., dated November 2021.
- Vision Plan, prepared by Jeff Brown Architecture, LLC, dated April 15, 2022.
- Geologic Map of the Tacoma 1:100,000-scale Quadrangle, Washington, compiled by J.E. Schuster et al., November 2015.
- Web Soil Survey (WSS), maintained by the Natural Resources Conservation Service under the United States Department of Agriculture (USDA).
- Puyallup Municipal Code (PMC).
- Liquefaction Susceptibility for Pierce County, incorporating data from the Washington State Department of Natural Resources, September 2004.

Project Description

Based on review of the referenced vision plan, the site will be developed with a new early learning center (ELC), administrative offices, and related facility improvements. Access to the parking and drive areas, which is proposed along the southern site half, will be provided by 33rd Street Southeast. The northern site area will contain various features related to the ELC, such as walkways, a barn, greenhouse, and a silo structure. Stormwater management is proposed using direct discharge to the Puyallup River by way of the existing ditch along 33rd Street Southeast. In the event additional capacity is needed, preliminary plans show a stormwater pond is proposed within the northwestern corner of the site.

Based on our experience with similar projects, the proposed structures will likely be two to three stories and constructed utilizing relatively lightly loaded wood framing supported on conventional foundations. Perimeter footing loads will likely be 1 to 2 kips per linear foot. Slab-on-grade loading is anticipated to be approximately 150 pounds per square foot (psf).

Grading plans were not provided for review at the time of this report; however, we anticipate grading activities will be relatively minor and will not need to extend beyond about five feet to establish building pad and roadway alignments. Cuts to construct the stormwater pond, where necessary, will likely be deeper.

If the above design assumptions either change or are incorrect, ESNW should be contacted to review the recommendations provided in this report. ESNW should review the final design to verify the geotechnical recommendations and conclusions provided in this report have been incorporated into the plans.

SITE CONDITIONS

Surface

The subject site is located along the west side of 33rd Street Southeast, directly northwest of the intersection with 8th Avenue Southeast, in Puyallup, Washington, as illustrated on the Vicinity Map (Plate 1). The site consists of two tax parcels (Pierce County parcel numbers 0420264019 and 0420264007) and totals approximately 5.9 acres of land. The southern portion of the site consists of an undeveloped grass field used for agricultural purposes. The northern portion of the site contains remnant building foundations and dilapidated structures. The site is vegetated with tall grass along the southern portion and is overgrown with brambles and invasive vegetation along the northern portion of the site. The existing topography is relatively flat, with less than about two feet of total elevation change across the site.

Subsurface

An ESNW representative observed, logged, and sampled seven test pits on May 26, 2022. The test pits were excavated within accessible portions of the property, using a trackhoe and operator retained by ESNW. The test pits were completed to evaluate and classify soil and groundwater conditions within the proposed development. The approximate locations of the test pits are depicted on Plate 2 (Test Pit Location Plan). Please refer to the test pit logs provided in Appendix A for a more detailed description of subsurface conditions. Representative soil samples collected at the test pit locations were evaluated in general accordance with both Unified Soil Classification System (USCS) and USDA methods and procedures.

Topsoil and Fill

Topsoil was observed extending to depths of approximately 6 to 12 inches below the existing ground surface (bgs). The topsoil thickness was variable, with vegetation roots extending below the topsoil zone and into the underlying native soil. The topsoil was characterized by dark brown color and the presence of fine organic material.

Fill was not encountered at the test locations during the subsurface exploration.

Native Soil

Native soil encountered at the test pit locations consisted primarily of loose to medium dense silty sand, sandy silt, and poorly graded gravel with sand (USCS: SM, ML, and GP, respectively). Interbedded silt and sand lenses were observed beginning at depths of about three to eight feet bgs. Native soil was observed primarily in a moist to wet condition, extending to the exploration terminus of about 17 feet bgs.

Geologic Setting

The referenced geologic map identifies Holocene nonglacial alluvium deposits (Qa) across the site and surrounding areas. According to the geologic map resource, Holocene alluvium consists of loose, stratified to massively bedded fluvial silt, sand, and gravel. Nonglacial alluvium is characteristic of modern floodplains and was deposited directly by streams and running water.

The referenced WSS resource identifies Briscot loam and Sultan silt loam as the primary soil units underlying the site and surrounding areas. The Briscot and Sultan series soils were formed in flood plains and is derived from alluvium.

Based on the field observations, the native soil is generally consistent with the locally mapped geologic setting of nonglacial alluvium deposits, Briscot series soils, and Sultan series soils.

Groundwater

Light to heavy groundwater seepage was encountered within all test pit locations (with the exception of TP-7), ranging from depths of approximately 3 to 11 feet bgs. Groundwater seepage is common within nonglacial alluvium deposits, and in our opinion, seepage zones should be anticipated depending on the time of year earthwork activities occur. Groundwater seepage rates and elevations fluctuate depending on many factors, including precipitation duration and intensity, the time of year, and soil conditions. In general, groundwater flow rates are higher during the winter, spring, and early summer months.

Environmentally Critical Areas Review

To evaluate the presence of environmentally critical areas, ESNW reviewed City of Puyallup mapping, Pierce County mapping, and PMC Chapter 21.06, which focuses on designations, definitions, and regulations of environmentally critical areas. Environmentally critical areas recognized in PMC 21.06 include erosion hazard areas, landslide hazard areas, critical aquifer recharge areas, and seismic hazard areas. Based on the review of the referenced liquefaction susceptibility map, the subject site is located within a moderate to high liquefaction susceptibility area.

Liquefaction Susceptibility

The referenced liquefaction susceptibility map indicates the subject site maintains moderate to high liquefaction susceptibility. Liquefaction is a phenomenon where saturated, loose, and sandy soil suddenly loses internal strength and behaves as a fluid. This behavior is in response to increased pore water pressures resulting from an earthquake or another intense ground shaking. The mapped hazard susceptibility is based on the presence of Holocene alluvium deposits and the presence of abandoned channel and meander-bend cutoff features north of the subject site, in addition to relatively shallow groundwater. Holocene alluvium deposits are normally consolidated and consist primarily of silty fine to medium sand and relatively clean, fine to medium sand, which is consistent with ESNW's subsurface exploration observations.

In our opinion, site susceptibility to liquefaction may be considered moderate. The presence of relatively shallow groundwater and loose to medium dense soils were the primary bases for this opinion. Foundation support derived on competent native soils or structural fill will help mitigate the potential for liquefaction-induced settlement during a seismic event.

DISCUSSION AND RECOMMENDATIONS

General

Based on the investigation, construction of the proposed development is feasible from a geotechnical standpoint. The primary geotechnical considerations for the proposal are associated with structural fill placement and compaction, utility trench support and backfill, drainage, foundation support, and temporary excavation support.

The proposed structures can be supported on conventional spread and continuous foundations bearing on undisturbed (competent) native soil, recompacted native soil, or new structural fill. Competent native soil suitable for support of the foundations will likely be encountered beginning at depths of about three to five feet bgs. Where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of the soil to the specifications of structural fill or overexcavation and replacement with suitable structural fill will likely be necessary.

In our opinion, the native nonglacial alluvium deposits should be considered unsuitable for infiltration purposes from a geotechnical standpoint, given the appreciable fines contents and presence of relatively shallow groundwater.

Site Preparation and Earthwork

Initial site preparation activities will consist of installing temporary erosion control measures, establishing grading limits, and performing clearing and site stripping. Subsequent earthwork activities will involve mass site grading and related infrastructure improvements. If earthwork activities occur during wet weather, additional drainage measures, cement treatment of native soil (where allowed by the presiding jurisdiction), and the use of select fill material will likely be necessary during construction.

Temporary Erosion Control

The following temporary erosion and sediment control Best Management Practices (TESC BMPs) should be considered:

- Temporary construction entrances and drive lanes, consisting of at least six inches of quarry spalls, should be considered to both minimize off-site soil tracking and provide a stable access entrance surface. Placing geotextile fabric underneath the quarry spalls will provide greater stability, if needed.

- Silt fencing should be placed around the site perimeter.

- When not in use, soil stockpiles should be covered or otherwise protected to reduce the potential for soil erosion, especially during periods of wet weather.

- Temporary measures for controlling surface water runoff, such as interceptor trenches, sumps, or interceptor swales, should be installed prior to beginning earthwork activities.

- Dry soils disturbed during construction should be wetted to minimize dust and airborne soil erosion.

- When appropriate, permanent planting or hydroseeding will help to stabilize site soils.

Additional TESC BMPs, as specified by the project civil engineer and indicated on the plans and/or as required by the permitting jurisdiction, should be incorporated into construction activities. Temporary erosion control measures may be modified during construction as site conditions require and as recommended by the site erosion control lead.

Stripping

Topsoil was encountered within the upper 6 to 12 inches at the test locations, and root intrusions generally extended below the topsoil and into the upper soil horizon. The organic-rich topsoil should be stripped and segregated into a stockpile for later use on site or to be exported off site. The material remaining immediately below the topsoil may have some root zones and will likely be variable in composition, density, and/or moisture content. The material exposed after initial stripping may not be suitable for direct structural support and may need to either be compacted in place or stripped and stockpiled for reuse as fill. Depending on the time of year stripping occurs, the soil exposed below the topsoil may be too wet to compact and may need to be aerated or treated.

ESNW should observe initial stripping activities to provide recommendations regarding stripping depths and material suitability.

In-situ and Imported Soils

Based on the conditions observed during the subsurface exploration, the on-site soil is highly moisture sensitive. Successful use of the on-site soil as structural fill will largely be dictated by the moisture content at the time of placement and compaction. Given the limited site area, on-site remediation efforts (such as aeration) may not be practicable. If the on-site soil cannot be successfully compacted, the use of an imported soil may be necessary. In our opinion, a contingency should be provided in the project budget for export of soil that cannot be successfully compacted as structural fill, particularly if structural backfill take place during periods of extended rainfall activity. In general, soils with fines contents greater than 5 percent typically degrade rapidly when exposed to periods of rainfall.

Imported structural fill should consist of a well-graded, granular soil that is capable of achieving a suitable working moisture content. During wet weather conditions, imported soil intended for use as structural fill should consist of a well-graded, granular soil with a fines content of 5 percent or less (where the fines content is defined as the percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction).

Structural Fill

Structural fill placed and compacted during site grading activities should meet the following specifications and guidelines:

• Structural fill material	Granular soil
• Moisture content	At or slightly above optimum
• Relative compaction (minimum)	95 percent (Modified Proctor)
• Loose lift thickness (maximum)	12 inches

The existing soil may not be suitable for use as structural fill unless the material is at (or slightly above) the optimum moisture content at the time of placement of and compaction. Soil shall not be placed dry of the optimum moisture content and should be evaluated by ESNW during construction. A minimum relative compaction of 90 percent may be feasible for certain areas of mass grading from a geotechnical standpoint but should be evaluated by ESNW at the time of construction and confirmed with the permitting jurisdiction.

With respect to underground utility installations and backfill, local jurisdictions may dictate the soil type(s) and compaction requirements. Unsuitable material or debris must be removed from structural areas, if encountered.

Wet Season Grading

If earthwork activities occur during wet weather, additional drainage measures, cement treatment of native soil (if approved by the presiding jurisdiction), and/or the use of select fill material will likely be necessary. Additionally, measures to protect structural subgrades should be considered if exposed during wet weather. Site-specific recommendations can be provided at the time of construction and may include leaving cut areas several inches above design subgrade elevations, covering working surfaces with crushed rock, protecting structural fill soil from adverse moisture conditions, and additional TESC recommendations. ESNW can assist in obtaining a wet season grading permit if required by the governing jurisdiction.

Excavations and Slopes

Based on the soil conditions observed at the test pit locations, the following allowable temporary slope inclinations, as a function of horizontal to vertical (H:V) inclination, may be used. The applicable Federal Occupation Safety and Health Administration and Washington Industrial Safety and Health Act soil classifications are also provided:

• Areas exposing groundwater seepage	1.5H:1V (Type C)
• Loose soil	1.5H:1V (Type C)
• Medium dense native soil	1H:1V (Type B)

The presence of groundwater may cause localized sloughing of temporary slopes. An ESNW representative should observe temporary and permanent slopes to confirm the slope inclinations are suitable for the exposed soil conditions and to provide additional excavation and slope recommendations, as necessary. If the recommended temporary slope inclinations cannot be achieved, temporary shoring may be necessary to support excavations. Permanent slopes should be planted with vegetation to enhance stability and to minimize erosion and should maintain a gradient of 2H:1V or flatter.

Foundations

The proposed structures can be constructed on conventional continuous and spread foundations supported on competent (undisturbed) native soil, recompacted native soil, or new structural fill placed directly on competent native soil. Competent native soil suitable for support of foundations will likely be encountered between depths of about three to five feet bgs. Where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of the soil to the specifications of structural fill or overexcavation and replacement with suitable structural fill will be necessary.

Provided the structures will be supported as described above, the following parameters can be used for design of the new foundations:

• Allowable soil bearing capacity	2,500 psf
• Passive earth pressure	300 pcf (equivalent fluid)
• Coefficient of friction	0.40

A one-third increase in the allowable soil bearing capacity may be assumed for short-term wind and seismic loading conditions. The above passive earth pressure and coefficient of friction values include a factor-of-safety of 1.5. With structural loading as expected, total settlement in the range of one inch and differential settlement of about one-half inch is anticipated. Most settlement should occur during construction when dead loads are applied.

Seismic Design

The 2018 International Building Code (2018 IBC) recognizes the most recent edition of the Minimum Design Loads for Buildings and Other Structures manual (ASCE 7-16) for seismic design, specifically with respect to earthquake loads. Based on the soil conditions encountered at the test pit locations, Site Class E should be used for design. However, based on our experience on projects in the local vicinity (and within adjacent cities across the valley floor), a designation of seismic Site Class D may be feasible pending the results of supplementary (deeper) subsurface exploration.

If further review of the seismic site class is desired, ESNW would be pleased to provide additional consulting services, including supplementary subsurface exploration, as needed.

Slab-on-Grade Floors

Slab-on-grade floors for the proposed structures should be supported on well-compacted, firm, and unyielding subgrades. Where feasible, the native soil exposed at the slab-on-grade subgrade levels can likely be compacted in situ to the specifications of structural fill if groundwater seepage does not interfere with compaction activities. Unstable or yielding subgrade areas should be recompacted or overexcavated and replaced with suitable structural fill prior to slab construction.

A capillary break consisting of at least four inches of free-draining crushed rock or gravel should be placed below the slabs. The free-draining material should have a fines content of 5 percent or less (where the fines content is defined as the percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction). In areas where slab moisture is undesirable, installation of vapor barriers below the slabs should be considered. If a vapor barrier is to be utilized, it should be a material specifically intended for use as a vapor barrier and should be installed per the specifications of the manufacturer.

Retaining Walls

Retaining walls must be designed to resist earth pressures and applicable surcharge loads. The following parameters may be used for design:

• Active earth pressure (unrestrained condition)	35 pcf (equivalent fluid)
• At-rest earth pressure (restrained condition)	55 pcf
• Traffic surcharge[*] (passenger vehicles)	70 psf (rectangular distribution)
• Passive earth pressure	300 pcf (equivalent fluid)
• Coefficient of friction	0.40
• Seismic surcharge	8H psf[†]

[*] *Where applicable.*
[†] *Where H equals the retained height (in feet).*

The passive earth pressure and coefficient of friction values include a safety factor of 1.5. The above design parameters are based on a level backfill condition and level grade at the wall toe. Revised design values will be necessary if sloping grades are to be used above or below retaining walls. Additional surcharge loading from adjacent foundations, sloped backfill, or other relevant loads should be included in the retaining wall design.

Retaining walls should be backfilled with free-draining material that extends along the height of the wall and a distance of at least 18 inches behind the wall. The upper 12 inches of the wall backfill may consist of a less permeable soil, if desired. A perforated drainpipe should be placed along the base of the wall and connected to an approved discharge location. A typical retaining wall drainage detail is provided on Plate 3. If drainage is not provided, hydrostatic pressures should be included in the wall design.

Drainage

Groundwater seepage should be anticipated in site excavations depending on the time of year grading operations take place. Temporary measures to control surface water runoff and groundwater during construction would likely involve interceptor trenches, interceptor swales, and sumps. ESNW should be consulted during preliminary grading to both identify areas of seepage and provide recommendations to reduce the potential for seepage-related instability.

Finish grades must be designed to direct surface drain water away from the structure and slopes. Water must not be allowed to pond adjacent to the structure or slopes. Grades adjacent to the building should be sloped away from the building at a gradient of either at least 2 percent for a horizontal distance of 10 feet or the maximum allowed by adjacent structures. In our opinion, foundation drains should be installed along building perimeter footings. A typical foundation drain detail is provided on Plate 4.

Infiltration Feasibility

As indicated in the *Subsurface* section of this report, the native soil encountered during the fieldwork was characterized primarily as nonglacial alluvium. Given the high fines contents of the tested soil and the presence of relatively shallow seepage zones, it is our opinion that infiltration is infeasible from a geotechnical standpoint. The in-situ condition of the native soil would likely impede the long-term performance and intended function of infiltration devices on site.

Preliminary Stormwater Detention Pond Design

We understand a stormwater detention pond (if necessary) would be constructed within the northwestern corner of the site. Groundwater was encountered at depths of approximately 3 to 11 feet bgs at the test pit locations, and we estimate the seasonal high groundwater table elevation occurs at about five to eight feet bgs. If a definitive groundwater elevation(s) is required, it is our opinion a groundwater monitoring program should be completed. The program would include installation of at least three piezometers within the proposed pond footprint and subsequent monitoring through at least one wet season. The information would be used to definitively evaluate seasonal high groundwater fluctuations over the course of the wet season. ESNW can prepare a proposal to complete a groundwater monitoring program, if requested.

Based on the native soil makeup, the need to install a pond liner should be anticipated. The pond liner should consist of a suitable low-permeability option and may include compacted till, clay, a geomembrane material, or concrete. Given the relative permeability of native soils, the need for imported pond-liner material should be anticipated. Where utilized, the impermeable soil liner should be at least 24 inches in thickness and installed around the entire bottom and sides of the pond. The pond-liner material should be installed in loose lifts of six inches or less and compacted to a relative compaction of 95 percent, based on the laboratory maximum dry density as determined by ASTM D1557. Depending on the grading activities necessary to install the stormwater pond and the seasonal high groundwater table elevation, it may also be necessary to design the pond to resist hydrostatic uplift.

The functionality of a pond is largely related to successful construction methods. In our experience, inadequate or poor construction techniques typically result in pond failure (due to leakage). Leakage repairs are difficult to detect and remediate, and as such, are costly and time-consuming to complete. ESNW should observe construction activities for the pond on a full-time basis to verify adequate soil compaction and installation methods and to provide supplementary recommendations, as necessary.

Utility Support and Trench Backfill

The native soil should generally be suitable for utility support. However, remedial measures may be necessary in some areas to provide support for utilities, such as overexcavation and replacement with structural fill and/or placement of geotextile fabric. Groundwater seepage may be encountered within utility excavations, and caving of trench walls may occur where groundwater is encountered. Active dewatering of seepage zones may be necessary during utility excavation and installation.

The on-site soil may not be suitable for use as structural backfill throughout utility trench excavations unless the soil is at (or slightly above) the optimum moisture content at the time of placement and compaction. If utility installation occurs during the wet season, site soils will likely be saturated and therefore difficult to use as utility backfill without treatment or aeration. Each section of the utility lines must be adequately supported in the bedding material. Utility trench backfill should be placed and compacted to the specifications of structural fill, as previously detailed in this report, or to the applicable specifications of the presiding jurisdiction.

Preliminary Pavement Sections

The performance of site pavements is largely related to the condition of the underlying subgrade. To ensure adequate pavement performance, the subgrade should be in a firm and unyielding condition when subjected to proofrolling with a loaded dump truck. Structural fill in pavement areas should be compacted to the specifications previously detailed in this report. Soft, wet, or otherwise unsuitable subgrade areas may still exist after base grading activities. Areas containing unsuitable or yielding subgrade conditions will require remedial measures, such as overexcavation and replacement with crushed rock or structural fill, prior to pavement.

For lightly loaded pavement areas subjected primarily to passenger vehicles, the following preliminary pavement sections may be considered:

- A minimum of two inches of hot-mix asphalt (HMA) placed over four inches of crushed rock base (CRB).

- A minimum of two inches of HMA placed over three inches of asphalt-treated base (ATB).

For relatively high volume, heavily loaded pavements areas subjected to occasional truck traffic, the following preliminary pavement sections may be considered:

- A minimum of three inches of HMA placed over six inches of CRB.

- A minimum of three inches of HMA placed over four and one-half inches of ATB.

The HMA, ATB, and CRB materials should conform to WSDOT and/or City of Puyallup specifications. All soil base material should be compacted to at least 95 percent of the maximum dry density. Final pavement design recommendations can be provided once final traffic loading has been determined. City of Puyallup standards may supersede the recommendations provided in this report.

Additional sub-pavement drainage should be considered where inverted crown roadways are used, such as lateral drains connecting to catch basins, given the low permeability of the native soil.

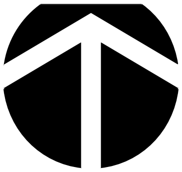
LIMITATIONS

This study has been prepared for the exclusive use of the Step by Step Family Support Center and its representatives. The recommendations and conclusions provided in this geotechnical engineering study are professional opinions consistent with the level of care and skill that is typical of other members in the profession currently practicing under similar conditions in this area. A warranty is not expressed or implied. Variations in the soil and groundwater conditions observed at the test locations may exist and may not become evident until construction. ESNW should reevaluate the conclusions provided in this geotechnical engineering study if variations are encountered.

Additional Services

ESNW should have an opportunity to review the final design with respect to the geotechnical recommendations provided in this report. ESNW should also be retained to provide testing and consultation services during construction.

Reference:
Pierce County, Washington
OpenStreetMap.org



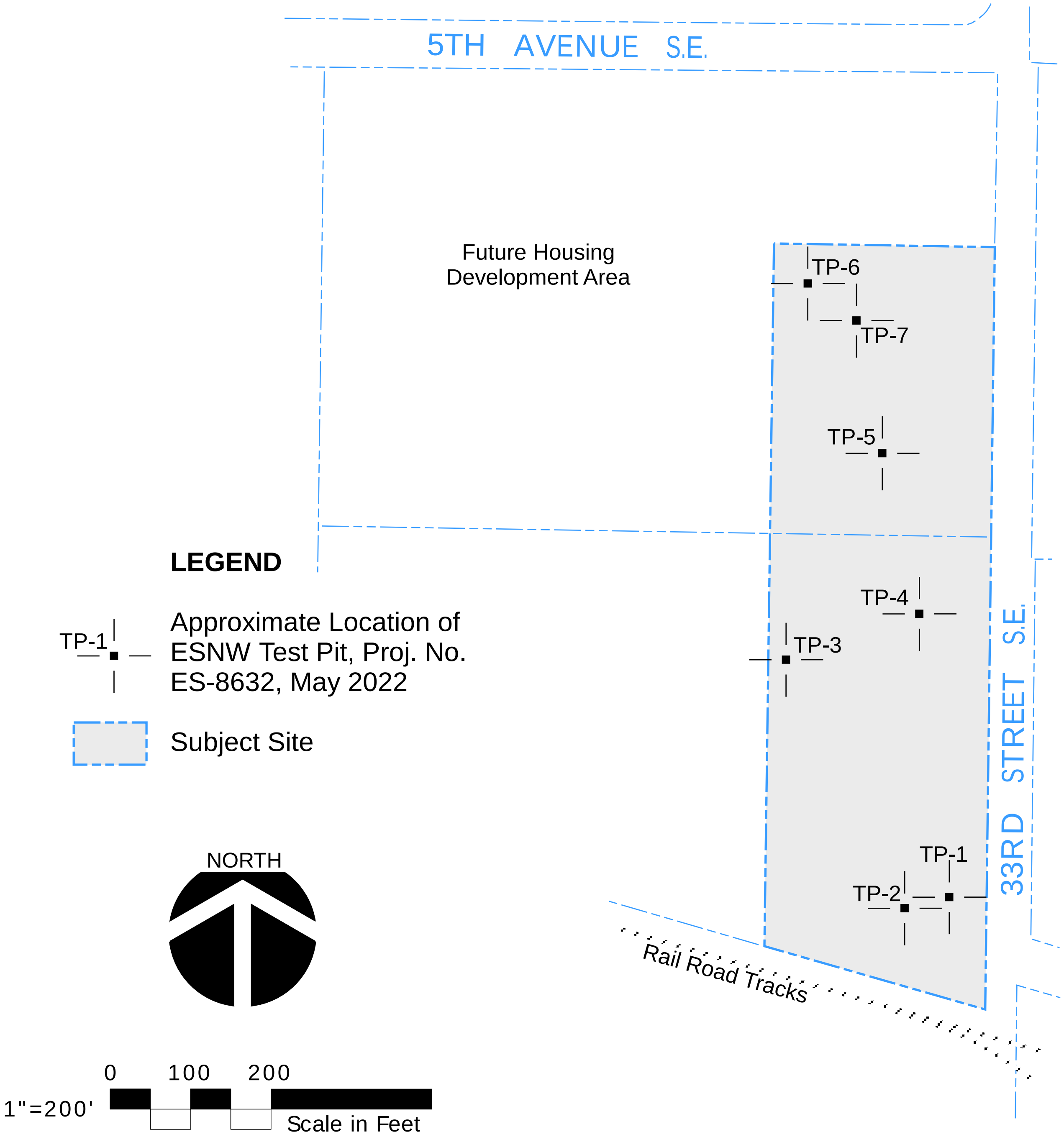
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Earth Solutions NWLLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Vicinity Map
Step by Step - ELC and Administrative Offices Facility
Puyallup, Washington

Drwn. MRS	Date 07/22/2022	Proj. No. 8632
Checked KTK	Date July 2022	Plate 1



LEGEND

TP-1 Approximate Location of ESNW Test Pit, Proj. No. ES-8632, May 2022

▨ Subject Site

NOTE: The graphics shown on this plate are not intended for design purposes or precise scale measurements, but only to illustrate the approximate test locations relative to the approximate locations of existing and / or proposed site features. The information illustrated is largely based on data provided by the client at the time of our study. ESNW cannot be responsible for subsequent design changes or interpretation of the data by others.

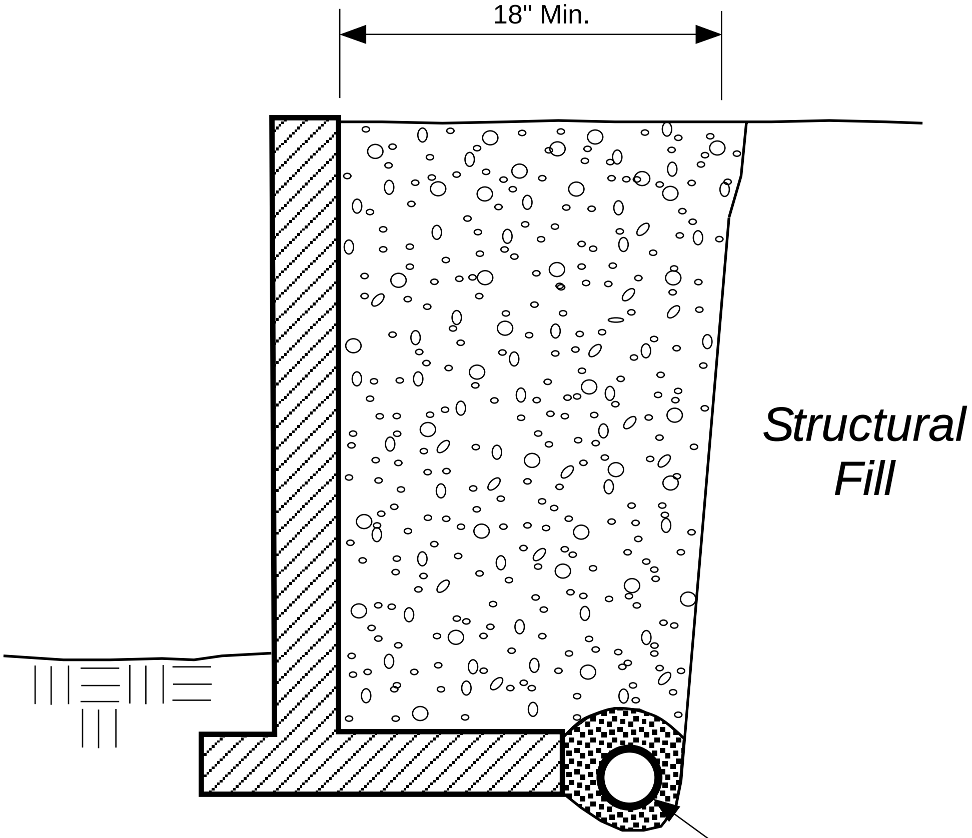
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Earth Solutions NW LLC

Earth Solutions NWLLC
Geotechnical Engineering, Construction
Observation/Testing and Environmental Services

Test Pit Location Plan
Step by Step - ELC and Administrative Offices Facility
Puyallup, Washington

Drwn. MRS	Date 07/22/2022	Proj. No. 8632
Checked KTK	Date July 2022	Plate 1



NOTES:

- Free-draining Backfill should consist of soil having less than 5 percent fines. Percent passing No. 4 sieve should be 25 to 75 percent.
- Sheet Drain may be feasible in lieu of Free-draining Backfill, per ESNW recommendations.
- Drain Pipe should consist of perforated, rigid PVC Pipe surrounded with 1-inch Drain Rock.

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:

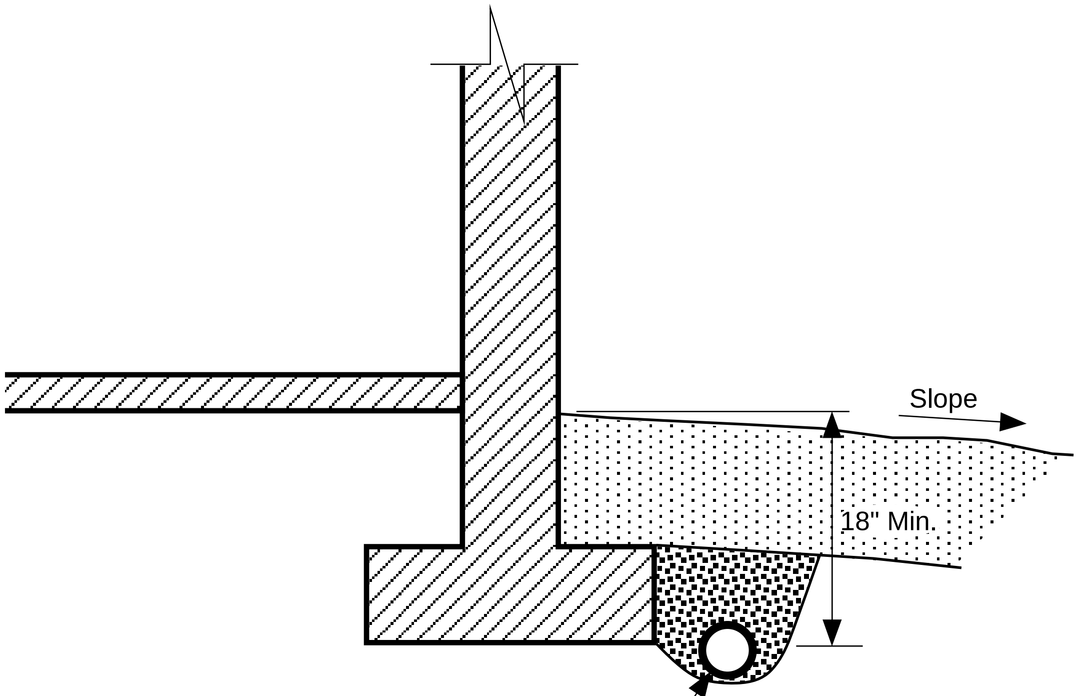
○ Free-draining Structural Backfill

▦ 1-inch Drain Rock

Earth Solutions NW LLC
Geotechnical Engineering, Construction
Observation/Testing and Environmental Services

Retaining Wall Drainage Detail
Step by Step - ELC and Administrative Offices Facility
Puyallup, Washington

Drwn. MRS	Date 07/22/2022	Proj. No. 8632
Checked KTK	Date July 2022	Plate 3



Perforated Rigid Drain Pipe
(Surround in Drain Rock)

NOTES:

- Do NOT tie roof downspouts to Footing Drain.
- Surface Seal to consist of 12" of less permeable, suitable soil. Slope away from building.

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:

░ Surface Seal: native soil or other low-permeability material.

▓ 1-inch Drain Rock

Earth Solutions NWLLC
Geotechnical Engineering, Construction
Observation/Testing and Environmental Services

Footing Drain Detail
Step by Step - ELC and Administrative Offices Facility
Puyallup, Washington

Drwn. MRS	Date 07/22/2022	Proj. No. 8632
Checked KTK	Date July 2022	Plate 4

Appendix A

Subsurface Exploration
Test Pit Logs

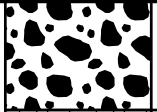
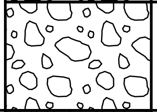
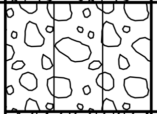
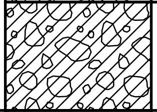
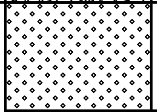
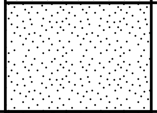
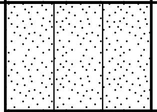
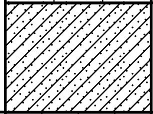
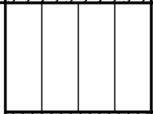
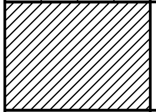
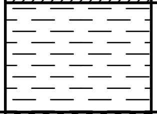
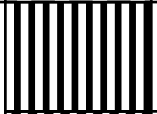
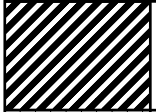
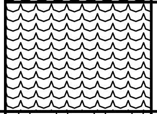
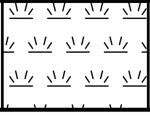
ES-8632

The subsurface conditions at the site were explored on May 26, 2022. Seven test pits were excavated using a trackhoe and operator retained by ESNW. The approximate locations of the test pits are illustrated on Plate 2 of this study. The test pit logs are provided in this Appendix. The test pits were advanced to a maximum depth of approximately 17 feet bgs.

The final logs represent the interpretations of the field logs and the results of laboratory analyses. The stratification lines on the logs represent the approximate boundaries between soil types. In actuality, the transitions may be more gradual.

Earth Solutions NW LLC

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

DUAL SYMBOLS are used to indicate borderline soil classifications.

The discussion in the text of this report is necessary for a proper understanding of the nature of the material presented in the attached logs.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-1

PAGE 1 OF 1

PROJECT NUMBER ES-8632
PROJECT NAME Step by Step - ELC and Administrative Offices Facility
DATE STARTED 5/26/22 **COMPLETED** 5/26/22
GROUND ELEVATION
EXCAVATION CONTRACTOR NW Excavating
LATITUDE 47.18528 **LONGITUDE** -122.25115
LOGGED BY KTK **CHECKED BY** KDH
GROUND WATER LEVEL:
NOTES
∇ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Grass
AFTER EXCAVATION

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			TPSL	1.0	Brown TOPSOIL, moderate caving to BOH
2.5		MC = 29.8% Fines = 53.6%	ML	4.5	Brown sandy SILT, loose, moist to wet -becomes gray [USDA Classification: LOAM]
5.0 7.5		MC = 28.4%	SM	10.0	Gray silty SAND, loose to medium dense, moist to wet -interbedded silt and sand lenses to 10'
10.0		MC = 37.4%	ML	12.0	Gray sandy SILT, medium dense, moist to wet -moderate groundwater seepage, gravels

Test pit terminated at 12.0 feet below existing grade. Groundwater seepage encountered at 11.0 feet during excavation. Caving observed from TOH to BOH.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW, LLC
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Fax: 425-449-4711

TEST PIT NUMBER TP-2

PAGE 1 OF 1

PROJECT NUMBER ES-8632

PROJECT NAME Step by Step - ELC and Administrative Offices Facility

DATE STARTED 5/26/22 **COMPLETED** 5/26/22

GROUND ELEVATION

EXCAVATION CONTRACTOR NW Excavating

LATITUDE 47.18528 **LONGITUDE** -122.25147

LOGGED BY KTK **CHECKED BY** KDH

GROUND WATER LEVEL:

NOTES

▽ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Grass

AFTER EXCAVATION

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			TPSL	0.5	Brown TOPSOIL
			ML		Brown sandy SILT, loose, moist to wet
2.5		MC = 28.8%			
					-moderate to severe caving to BOH
					-becomes gray, loose to medium dense
5.0		MC = 32.9%			
					-wood/stump debris
7.5					
					-light groundwater seepage
10.0					-becomes medium dense
		MC = 42.0%		11.0	

Test pit terminated at 11.0 feet below existing grade. Groundwater seepage encountered at 9.5 feet during excavation. Caving observed from 3.0 feet to BOH.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW LLC

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TEST PIT NUMBER TP-3

PAGE 1 OF 1

PROJECT NUMBER ES-8632

PROJECT NAME Step by Step - ELC and Administrative Offices Facility

DATE STARTED 5/26/22 **COMPLETED** 5/26/22

GROUND ELEVATION

EXCAVATION CONTRACTOR NW Excavating

LATITUDE 47.18592 **LONGITUDE** -122.25194

LOGGED BY KTK **CHECKED BY** KDH

GROUND WATER LEVEL:

NOTES

∇ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Grass

AFTER EXCAVATION

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG		MATERIAL DESCRIPTION
0.0			TPSL		0.5	Brown TOPSOIL, light to moderate caving to BOH
			ML			Brown sandy SILT, loose, moist to wet
2.5		MC = 32.2%				
					4.0	
			SM			Gray silty SAND, loose, moist to wet
						-light groundwater seepage
5.0		MC = 26.0%				
						-becomes loose to medium dense
						-approximate 12" silt lens
7.5						
					9.0	
			ML			Gray sandy SILT, medium dense, moist to wet
10.0						
						-light groundwater seepage
12.5		MC = 36.3%			12.5	

Test pit terminated at 12.5 feet below existing grade. Groundwater seepage encountered at 4.5 and 11.0 feet during excavation. Caving observed from TOH to BOH.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW, LLC
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TEST PIT NUMBER TP-4

PAGE 1 OF 1

PROJECT NUMBER ES-8632

PROJECT NAME Step by Step - ELC and Administrative Offices Facility

DATE STARTED 5/26/22 **COMPLETED** 5/26/22

GROUND ELEVATION

EXCAVATION CONTRACTOR NW Excavating

LATITUDE 47.18612 **LONGITUDE** -122.25127

LOGGED BY KTK **CHECKED BY** KDH

GROUND WATER LEVEL:

NOTES

∇ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Grass

AFTER EXCAVATION

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			TPSL	0.6	Brown TOPSOIL
			SM		Brown silty SAND, loose, moist to wet
2.5					
		MC = 28.8% Fines = 46.1%			-moderate caving to BOH [USDA Classification: very fine sandy LOAM] -becomes gray, loose to medium dense
5.0					
					-light groundwater seepage
		MC = 37.8%	ML	7.0	Gray sandy SILT, medium dense, moist to wet
7.5					
					-interbedded sand lenses to BOH
10.0					-wood debris
		MC = 33.9%		12.0	

Test pit terminated at 12.0 feet below existing grade. Groundwater seepage encountered at 6.5 feet during excavation. Caving observed from 3.0 feet to BOH.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW, LLC
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TEST PIT NUMBER TP-5

PAGE 1 OF 1

PROJECT NUMBER ES-8632

PROJECT NAME Step by Step - ELC and Administrative Offices Facility

DATE STARTED 5/26/22 **COMPLETED** 5/26/22

GROUND ELEVATION

EXCAVATION CONTRACTOR NW Excavating

LATITUDE 47.18673 **LONGITUDE** -122.25147

LOGGED BY KTK **CHECKED BY** KDH

GROUND WATER LEVEL:

NOTES

▽ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Brambles

AFTER EXCAVATION

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			TPSL	0.5	Dark brown TOPSOIL
			ML		Brown sandy SILT, loose, moist to wet
					-slight caving to BOH
2.5		MC = 30.7%			
					-interbedded silt lenses to 7'
		MC = 33.8%			
5.0					
					-becomes gray, loose to medium dense
7.5					-interbedded sand lenses to BOH
		MC = 38.7% Fines = 96.7%			[USDA Classification: LOAM]
10.0					-light groundwater seepage
		MC = 36.9%		11.0	

Test pit terminated at 11.0 feet below existing grade. Groundwater seepage encountered at 10.0 feet during excavation. Caving observed from 2.0 feet to BOH.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW, LLC
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TEST PIT NUMBER TP-6

PAGE 1 OF 2

PROJECT NUMBER ES-8632

PROJECT NAME Step by Step - ELC and Administrative Offices Facility

DATE STARTED 5/26/22 **COMPLETED** 5/26/22

GROUND ELEVATION

EXCAVATION CONTRACTOR NW Excavating

LATITUDE 47.18736 **LONGITUDE** -122.25199

LOGGED BY KTK **CHECKED BY** KDH

GROUND WATER LEVEL:

NOTES

∇ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Brambles

AFTER EXCAVATION

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			TPSL	1.0	Dark brown TOPSOIL -moderate caving to BOH
2.5 5.0		MC = 23.0% MC = 28.0%	SM	7.0	Brown silty SAND, loose, moist to wet -becomes gray, interbedded silt and sand lenses -tree debris -light to moderate groundwater seepage
7.5 10.0			ML	10.0	Gray sandy SILT, loose to medium dense, moist to wet -tree debris (large)
12.5 15.0		MC = 29.9% Fines = 33.6%	SM	15.0	Gray silty SAND, loose to medium dense, moist to wet -interbedded silt and sand lenses [USDA Classification: slightly gravelly very fine sandy LOAM]

(Continued Next Page)

TEST PIT NUMBER TP-6

PROJECT NUMBER ES-8632

PROJECT NAME Step by Step - ELC and Administrative Offices Facility

DATE STARTED 5/26/22 **COMPLETED** 5/26/22

GROUND ELEVATION

EXCAVATION CONTRACTOR NW Excavating

LATITUDE 47.18736 **LONGITUDE** -122.25199

LOGGED BY KTK **CHECKED BY** KDH

GROUND WATER LEVEL:

NOTES

∇ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Brambles

AFTER EXCAVATION

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
15.0		MC = 10.6% Fines = 1.1%	GP	17.0	Gray poorly graded GRAVEL with sand, medium dense, wet -moderate to heavy groundwater seepage [USDA Classification: extremely gravelly coarse SAND]

Test pit terminated at 17.0 feet below existing grade. Groundwater seepage encountered at 6.5 and 11.0 feet during excavation. Caving observed from TOH to BOH.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NWLLC
Earth Solutions NW, LLC
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TEST PIT NUMBER TP-7

PAGE 1 OF 1

PROJECT NUMBER ES-8632
PROJECT NAME Step by Step - ELC and Administrative Offices Facility
DATE STARTED 5/26/22 **COMPLETED** 5/26/22
GROUND ELEVATION
EXCAVATION CONTRACTOR NW Excavating
LATITUDE 47.18719 **LONGITUDE** -122.25167
LOGGED BY KTK **CHECKED BY** KDH
GROUND WATER LEVEL:
NOTES
∇ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Brambles
AFTER EXCAVATION

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			TPSL	1.0	Dark brown TOPSOIL
		MC = 26.2%	SM	3.0	Brown silty SAND, loose, moist
2.5					
			ML		Brown sandy SILT, loose to medium dense, moist
5.0					-sand lenses
		MC = 34.2%			-becomes gray, medium dense
7.5					
					-sand lenses
10.0		MC = 37.3%			
12.5					
		MC = 38.2%		13.0	

Test pit terminated at 13.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Appendix B

Laboratory Test Results
Grain Size Distribution

ES-8632

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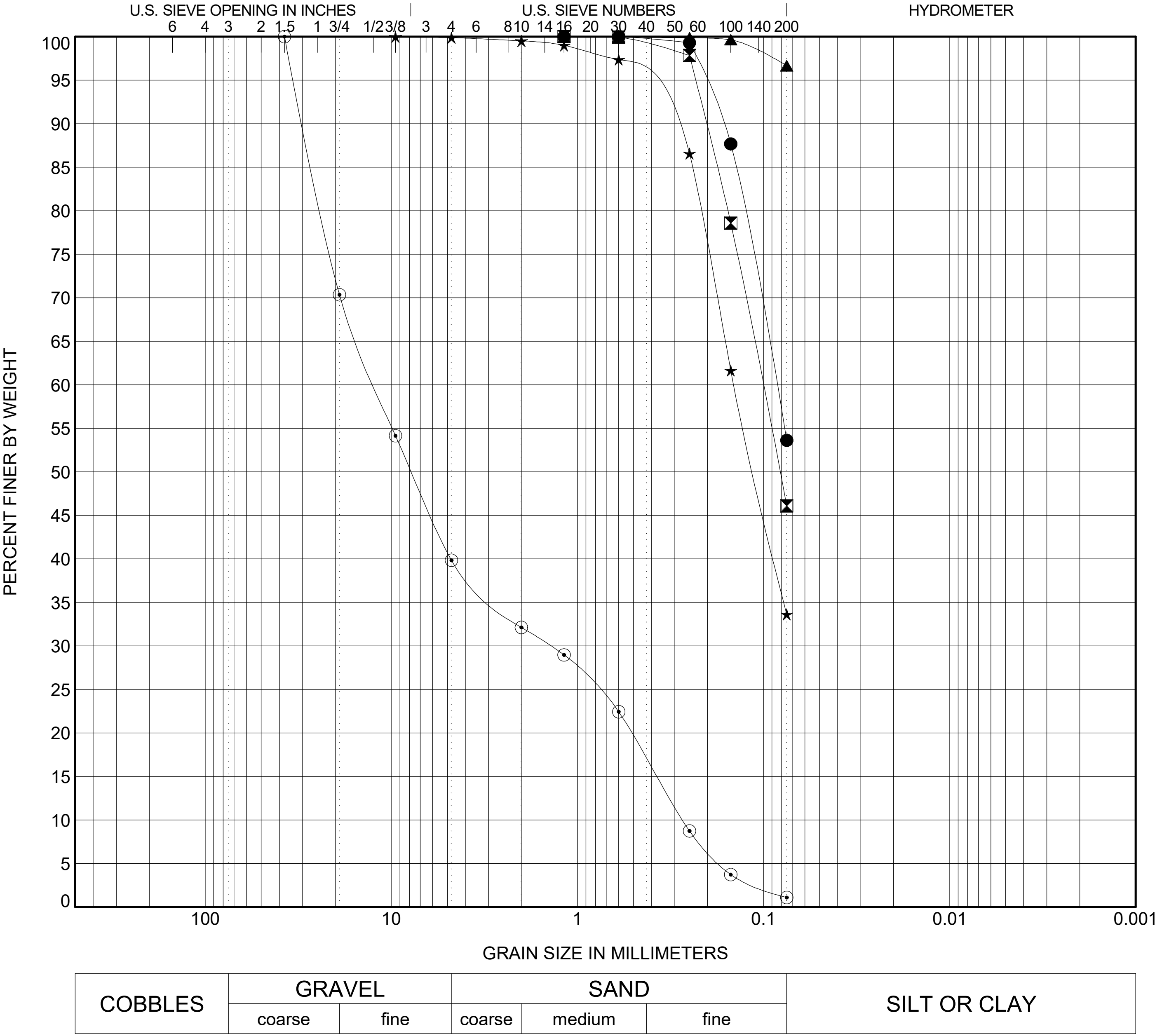
GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-8632 **PROJECT NAME** Step by Step - ELC and Administrative Offices Facility



Specimen Identification			Classification	Cc	Cu
●	**TP-01**	**3.00ft.**	**USDA: Brown Loam. USCS: Sandy ML.**		
⧗	**TP-04**	**3.50ft.**	**USDA: Brown Very Fine Sandy Loam. USCS: SM.**		
▲	**TP-05**	**8.00ft.**	**USDA: Gray Loam. USCS: ML.**		
★	**TP-06**	**11.00ft.**	**USDA: Gray Slightly Gravelly Very Fine Sandy Loam. USCS: SM.**		
⊙	**TP-06**	**17.00ft.**	**USDA: Gray Extremely Gravelly Coarse Sand. USCS: GP with Sand.**	**0.60**	**45.03**

Specimen Identification			D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
●	**TP-01**	**3.0ft.**	**1.18**	**0.085**						**53.6**	
⧗	**TP-04**	**3.5ft.**	**1.18**	**0.101**						**46.1**	
▲	**TP-05**	**8.0ft.**	**1.18**							**96.7**	
★	**TP-06**	**11.0ft.**	**9.5**	**0.144**						**33.6**	
⊙	**TP-06**	**17.0ft.**	**37.5**	**12.205**	**1.403**	**0.271**				**1.1**	

Report Distribution

ES-8632

EMAIL ONLY

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